SILVICULTURAL CONTROL OF DWARF MISTLETOE IN YOUNG LODGEPOLE PINE STANDS: PROGRESS REPORT

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SILVICULTURAL CONTROL OF DWARF MISTLETOE IN YOUNG LODGEPOLE PINE STANDS

(STUDY 2301, E-18)

by

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In 1965 a cooperative study between the Rocky Mountain Region and the Rocky Mountain Forest and Range Experiment Station was begun to determine the effectiveness of dwarf mistletoe sanitation in young lodgepole pine stands.[1/] A total of 37 half-acre plots were established in 20, 30, and 40 year-old stands with various degrees of infection. Plots were established in the Routt, Arapaho, and Roosevelt National Forests.

The purpose of this report is to record the 5-year progress of the study which includes the completion of the second sanitation in 1968 and 1969 and thinning in 1970.

The Second Sanitation

Study plots were established in 1965 and 1966. All plots designated for sanitation were treated at the time of establishment. The treated plots established in 1965 were resanitized in 1968, while those established in 1966 were resanitized in 1969. In each sanitation procedure all visibly infected trees were cut. Pruning was not part of the treatments. Operational control projects would logically combine thinning and sanitation. They were kept separate here, however, because we wanted to know the degree to which dwarf mistletoe appeared (due to development of latent and missed infections) after initial sanitation. For all 20-year-old and most 30-year-old stands, the number of infected trees cut at the time of the second

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[1/] Hawksworth, F. G. and W. F. Bailey. Establishment Report and Study Plan. Silvicultural control of dwarf mistletoe in young lodgepole pine stands. U. S. Forest Service Report, 12 p., January 1967.

sanitation was about one-half the percentage cut in the initial sanitation. The rate of increase was apparently not influenced by the amount of infection in the original stand at the start of the study. For example, stands with 4 percent of the trees infected originally had 2 percent more infected at the second sanitation and those with 40 percent of the trees infected originally had 20 percent more at the time of the second sanitation. This rate of increase obviously does not apply to older, heavily infected stands.

Thinning

All treated plots and four mistletoe-free plots (numbers 14, 19, 23, and 34) were thinned in 1970 using the current thinning guides for the Routt National Forest. In general, this called for a spacing of approximately 10 x 10 feet or about 425 trees per acre in stands of these d.b.h. ranges (2-4 inches). In some plots this was not possible because the number of trees had been reduced drastically by the two sanitation treatments. The work was done under contract with Forest Pest Control funds.

Results

A breakdown of the 37 plots by age class, infection class, and treatment is given in Table 1. Individual data for each plot, including number of trees per acre, average d.b.h., and percent of trees infected before and after treatment are given in Appendix I.

Summaries of the stands are given for average stand diameter (Table 2), number of trees per acre (Table 3), and percent of trees infected (Table 4).

Discussion

The tentative results suggest that sanitation is feasible in 20-year-old stands regardless of the amount of dwarf mistletoe in them. The maximum amount of infection in 20-year-old stands in this study was about 40 percent, which leaves ample apparently disease-free trees to obtain desired spacing levels.

In 30-year-old stands, the results are not yet as certain but it appears that most such stands can also be successfully sanitized, particularly if less than half of the trees are infected. Even though two plots in this age class averaged 48 percent of the trees infected, a residual stand of 267 apparently mistletoe-free trees per acre was left after two sanitations and one thinning.

In 40-year-old stands, the mistletoe was concentrated in groups of trees or centers with nearly every tree showing infections. The treatments essentially clearcut these infection centers. Many of the residual trees left after the first sanitation showed latent or missed infections and had to be cut at the time of the second sanitation. Sanitation to remove all infected trees cannot be recommended as a procedure in the management of stands with over half of the trees infected.

The next examination in 1975 will include growth measurements and detailed examinations of each tree to determine the extent of dwarf mistletoe infection. The current low levels of dwarf mistletoe in the treated plots can probably be maintained by additional thinnings at 20- and 30-year intervals. Future examinations will determine the impact from dwarf mistletoe and the need for additional treatments.

Table 1.--Plot summary.

Percent infection (1965)	Treatment	Age Class - Years (1965) 15-24 No. of plots	15-24 Plot nos.	25-34 No. of plots	25-34 Plot nos.	35-44 No. of plots	35-44 Plot nos.
None	None	1	(6)	2	(22, 27)	2	(13, 18)
	TSI	1	(34)	1	(23)	2	(14, 19)
1-20%	None	4	(7, 8, 9, 10)	2	(25, 32)	--	--
	DM+TSI	2	(2, 5)	2	(21, 28)	1	(15)
21-40%	None	2	(35, 36)	2	(26, 31)	--	--
	DM+TSI	3	(1, 3, 4)	2	(29, 37)	--	--
41-60%	None	--	--	2	(24, 33)	--	--
	DM+TSI	--	--	2	(20, 30)	1	(12)
61-80%	None	--	--	--	--	1	(11)
	DM+TSI	--	--	--	--	2	(16, 17)

Table 2.--Average stand diameters in 1965 and 1970 (Intensive plots only)

Percent infection (1965)	Treatment	Year	Age Class - Years (1965) 15-24 No. of plots	15-24 Ave. d.b.h. (in.)	25-34 No. of plots	25-34 Ave. d.b.h. (in.)	35-44 No. of plots	35-44 Ave. d.b.h. (in.)
None	None	1965	1	1.4	2	2.8	2	2.1
		1970		2.0		2.9		2.3
	TSI	1965	1	1.8	1	2.5	2	2.4
		1970		3.0		4.2		4.1
1-20%	None	1965	4	1.4	2	2.1	--	--
		1970		1.8		2.4		
	DM+TSI	1965	2	1.3	2	2.2	1	2.3
		1970		2.4		4.0		3.5
21-40%	None	1965	2	1.5	2	1.6	--	--
		1970		1.8		1.8		
	DM+TSI	1965	3	1.5	2	1.7	--	--
		1970		2.9		2.6		
41-60%	None	1965	--	--	2	2.1	--	--
		1970				2.3		
	DM+TSI	1965	--	--	2	2.2	1	2.4
		1970				3.6		2.9
61-80%	None	1965	--	--	--	--	1	2.2
		1970						2.3
	DM+TSI	1965	--	--	--	--	2	2.9
		1970						3.6

Table 3.--Number of trees over 6 feet high per acre (intensive plus extensive plots).

Percent infection (1965)	Treatment	Year	Age Class - Years (1965) 15-24 No. of plots	15-24 Trees per acre	25-34 No. of plots	25-34 Trees per acre	35-44 No. of plots	35-44 Trees per acre
None	None	1965	1	2,382	2	1,789	2	3,508
		1970		2,682		1,747		3,384
	TSI	1965	1	1,330	1	1,699	2	2,444
		1970		356		415		476
1-20%	None	1965	4	1,936	2	1,446	--	--
		1970		1,838		1,446		
	DM+TSI	1965	2	2,479	2	1,507	1	2,801
		1970		378		336		457
21-40%	None	1965	2	1,605	2	2,450	--	--
		1970		1,605		2,438		
	DM+TSI	1965	3	1,744	2	1,719	--	--
		1970		270		292		
41-60%	None	1965	--	--	2	1,437	--	--
		1970				1,437		
	DM+TSI	1965	--	--	2	1,782	1	1,538
		1970				267		225
61-80%	None	1965	--	--	--	--	1	2,474
		1970						2,516
	DM+TSI	1965	--	--	--	--	2	1,764
		1970						98

Table 4.-- Percent of trees with dwarf mistletoe (intensive plots only)

Percent infection (1965)	Treatment	Year	Age Class - Years (1965) 15-24 No. of plots	15-24 Trees infected	25-34 No. of plots	25-34 Trees infected	35-44 No. of plots	35-44 Trees infected
None	None	1965	1	0	2	0	2	0
		1970		0		0		0
	TSI	1965	1	0	1	0	2	0
		1970		0		0		0
1-20%	None	1965	4	8	2	16	--	--
		1970		20		19		
	DM+TSI	1965	2	8	2	12	1	11
		1970		*		*		*
21-40%	None	1965	2	34	2	22	--	--
		1970		33		30		
	DM+TSI	1965	3	25	2	29	--	--
		1970		*		*		
41-60%	None	1965	--	--	2	52	--	--
		1970				58		
	DM+TSI	1965	--	--	2	48	1	49
		1970				*		*
61-80%	None	1965	--	--	--	--	1	67
		1970						63
	DM+TSI	1965	--	--	--	--	--	72
		1970						*

*Essentially all trees that were visibly infected were cut.

Appendix I. Individual plot data in 1965 and 1970.

Plot no.	Age class 1965	Infection class 1965	Treatment	Trees/acre 1965 or 1966	Trees/acre 1970	Pct. infection 1965 or 1966	Pct. infection 1970	Ave. d.b.h. 1965 or 1966	Ave. d.b.h. 1970
1	15-24	21-40	DM+TSI	972	202	24	*	1.9	3.4
2	15-24	1-20	DM+TSI	2,616	370	12	*	1.2	2.1
3	15-24	21-40	DM+TSI	2,538	296	29	*	1.1	2.1
4	15-24	21-40	DM+TSI	1,723	311	21	*	1.6	2.9
5	15-24	1-20	DM+TSI	2,342	385	4	*	1.3	2.6
6	15-24	None	None	2,382	2,682	0	0	1.4	2.0
7	15-24	1-20	None	827	732	17	28	1.7	2.3
8	15-24	1-20	None	2,101	1,380	16	23	1.5	1.8
9	15-24	1-20	None	2,737	3,227	11	24	1.4	1.7
10	15-24	1-20	None	2,078	2,012	5	11	1.2	1.7
11	35-44	61-80	None	2,474	2,516	67	63	2.2	2.3
12	35-44	41-60	DM+TSI	1,538	225	49	*	2.4	2.9
13	35-44	None	None	2,442	2,425	0	0	2.0	2.1
14	35-44	None	TSI	1,163	372	0	0	2.8	4.5
15	35-44	1-20	DM+TSI	2,801	457	11	*	2.3	3.5
16	35-44	61-80	DM+TSI	1,893	140	68	*	3.1	5.4
	35-44	61-80	DM+TSI	1,634	55	75	*	2.7	3.2
	35-44	None	None	4,573	4,343	0	0	2.2	2.4
19	35-41	None	TSI	3,724	579	0	0	2.3	3.8
20	25-34	41-60	DM+TSI	2,323	366	46	*	2.4	4.5
21	25-34	1-20	DM+TSI	1,042	308	20	*	2.8	4.7
22	25-34	None	None	445	445	0	0	4.3	4.6
23	25-34	None	TSI	1,699	415	0	0	2.5	4.2
24	25-34	41-60	None	1,149	1,149	41	46	2.3	2.6
25	25-34	1-20	None	987	987	19	40	2.4	2.6
26	25-34	21-40	None	3,052	3,028	21	34	1.5	1.7
27	25-34	None	None	3,132	3,048	0	0	2.4	2.5
28	25-34	1-20	DM+TSI	1,972	364	4	*	2.0	3.5
29	25-34	21-40	DM+TSI	2,052	336	31	*	1.8	2.8
30	25-34	41-60	DM+TSI	1,240	168	50	*	2.0	2.8
31	25-34	21-40	None	1,848	1,848	22	23	1.8	2.0
32	25-34	1-20	None	1,904	1,904	13	14	1.9	2.2
33	25-34	61-80	None	1,724	1,724	62	66	1.9	2.1
34	15-24	None	TSI	1,330	356	0	0	1.8	3.0
35	15-24	21-40	None	1,192	1,192	40	41	1.2	1.5
36	15-24	21-40	None	2,018	2,018	28	39	1.6	1.9
37	25-34	21-40	DM+TSI	1,386	248	27	*	1.4	2.0

* = sanitized